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AUTHOR(S):

Hamatani, Iwao

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## NOTES ON VELIGERS OF JAPANESE OPISTHOBRANCHS (4)<sup>1,2)</sup>

IWAO HAMATANI

Sennan Senior High School, Tarui, Osaka Pref.

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*With 8 Text-figures*

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Veligers of ten species of the Japanese Opisthobranchs were already described by the present author in three previous papers. Here, in this fourth paper, are added the following three species: *Doriopsis viridis* PEASE and *D. aurantiaca* ELIOT of Dorididae, and *Eubranchius misakiensis* BABA of Eolidacea. The first one was collected near the Seto Marine Biological Laboratory, while the second and the third were collected from Osaka Bay.

### *Doriopsis viridis* PEASE

(Figs. 1-3)

Several animals of this species (Fig. 1, A) (see BABA and HAMATANI, 1961. pp. 63-65) and three egg-masses (Fig. 1, B) were collected from the under surface of a stone in a tide-pool on Hatake-sima in Tanabe Bay near the Seto Marine Biological Laboratory on July 23, 1960. One of these animals laid an egg-mass on the bottom of a glass-vessel on the next day of collecting. This egg-mass was quite the same as those found in the natural environment. It is coiled sinistrally  $4\frac{1}{4}$  times, measures  $12 \times 25$  mm in outline of the coil and is coloured faintly yellow. The ribbon is 1.5 mm wide and 95 mm in whole length; its free border is never longer than the attachment border so that the ribbon surface is never waved. Egg-capsules of the newly laid egg-mass (Fig. 2) are nearly oval in shape and 80 to 110  $\mu$  in long diameter. Ova are round and about 67  $\mu$  in diameter.

*Early development:* The observations were made on the above-mentioned egg-mass laid in a glass-vessel on July 24, 1960 when the room temperature was 31°C. The slight movement of embryo within the capsule began on the third day, the embryo passed into young veligers on the fourth day and attained the completed stage of veliger on the fifth day; at this time the egg-mass was tinted

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2) A part of the studies supported by the financial aid granted from the Ministry of Education.

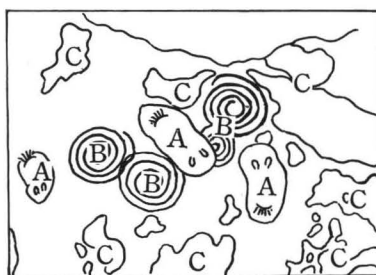


Fig. 1. *Doriopsis viridis* PEASE.

- A. Slugs.
- B. Egg-masses.
- C. Keratose sponges.

Three faintly yellowish egg-masses are laid by indigo blue slugs which prey upon a keratose sponge which is extremely thin, fragile and coloured indigo blue just like the slugs<sup>1)</sup>.

1) This picture was taken by Dr. I. YAMAZI of the Seto Marine Biological Laboratory on Hatake-sima in summer, 1961 and generously offered to the author. Here, the author wants to express hearty thanks for his kindness.

faintly purplish. The first hatching out was observed on the next day, thus it took about six days from the spawning to the hatching out of the first veliger at the room temperature from 27° to 34°C.

*Veligers*: The newly hatched veliger (Fig. 3, A) is transparent and rather small; its long diameter is 100 to 125  $\mu$  and short diameter is 75 to 80  $\mu$  on an average. The shell (Fig. 3, B and C) is sinistral, elongate ovoid in shape and 77 $\times$ 100  $\mu$  on an average. It is faintly tinged purplish and has a sculpture consisting of a number of very small dots over the whole surface; particularly many minute granule-like ornaments are distributed on the axial half of the shell, especially densely near the aperture. The aperture is very large, occupying more than a half of the frontal projection of the shell. The operculum is circular in shape. The velum and subvelum are formed as usual, both contain several small refracting granules. The statocysts are well marked, although the eyes are absent. The foot is rather thick, covered with numerous short cilia all over the surface,

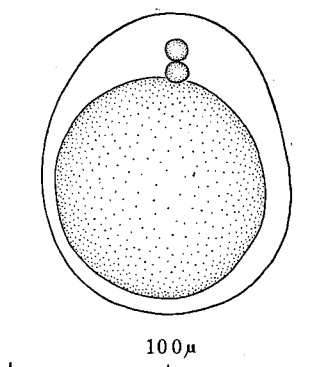


Fig. 2. *Doriopsis viridis* PEASE.  
Ovum in the capsule.

and usually it does not protrude beyond the operculum edge; any special cells are not enclosed within it. The stomach has a thick wall enclosing some refracting granules. There are two liver lobes, the left one of which is larger than the right as usual, slightly purplish brown in colour, containing many refracting granules in its surface wall and shows a slight retractile movement. While, the right is slightly brownish in colour. There is only one large spherical body (1. sph.) on the right side of the veliger just behind the intestine, which is enclosed in a capsule-like sack. This body reminds one of three large spherical bodies of *Halgerda rubicunda* BABA (cf. HAMATANI, 1960), but the former differs distinctly from the latter in number and in that it is enclosed within the sack. Besides, there is a small spherical body (s. sph.) just behind the anus, which contains several minute granules; this body seems to correspond to that found in *H. rubicunda*. The nature of these bodies are quite unknown in this species,

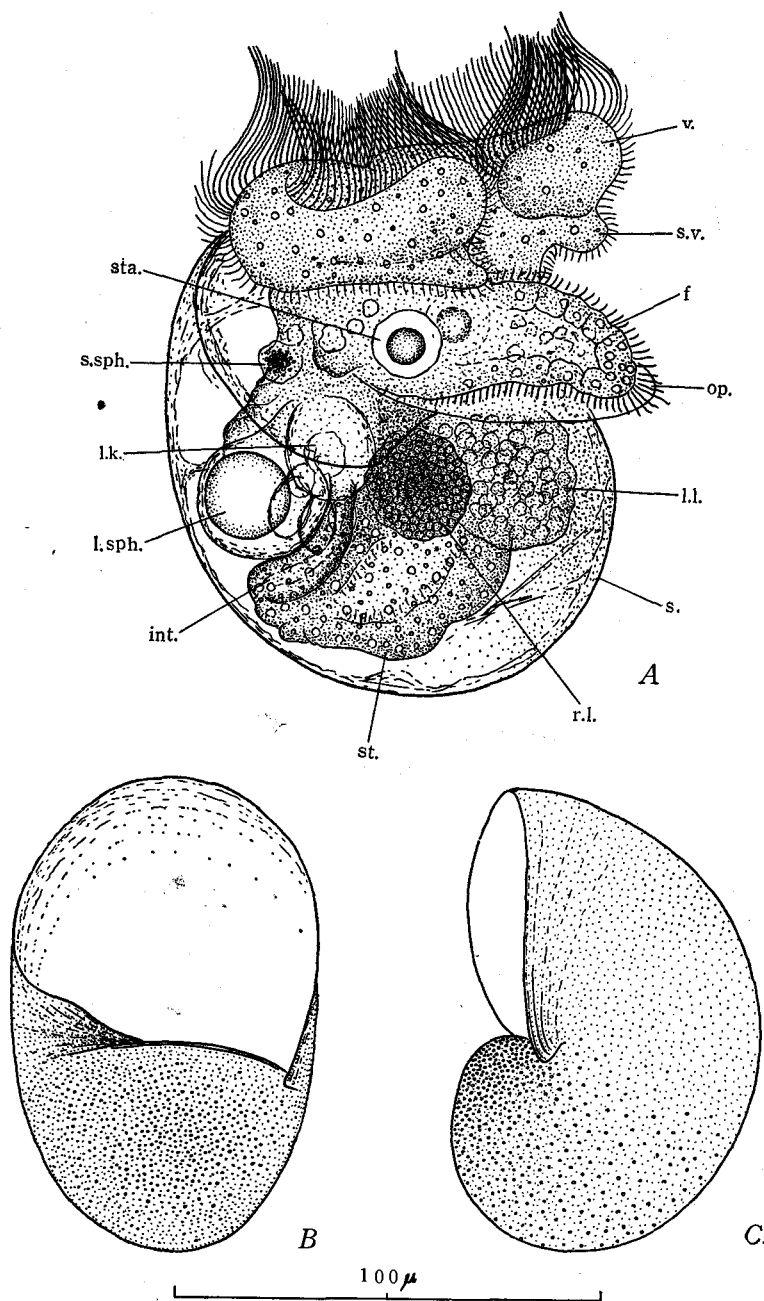


Fig. 3. *Doriopsis viridis* PEASE.

- A. Newly hatched veliger, from the right side.  
 B. Larval shell, from the ventral side.  
 C. The same, from the apex.

Abbreviations: f...foot, int...intestine, l.sph...large spherical body, l.k...larval kidney, l.l...left liver, oes...oesophagus, op...operculum, r.l...right liver, r.m...retractor muscle, s...shell, s.sph...small spherical body, st...stomach, sta...statocyst, s.v...subvelum, un.o...unknown organ, v...velum.

either. The small spherical body behind the anus might be a rudimentary eye, although this is quite uncertain.

*Doriopsis aurantiaca* (ELIOT)

(Figs. 4-5)

The animals of this species are not rare on the shores of Osaka Bay. Only one examined egg-mass (Fig. 4), together with two animals of 25 mm long, was collected from the under surface of a stone at the shore of Ôkawa on the southeastern coast of the bay on August 27, 1961. This egg-mass (see also BABA and HAMATANI, 1961) is 15×20 mm in extent and its ribbon is 4 to 5 mm in width. It is coiled sinistrally 3 times and coloured yellow. Although the free border of the ribbon is somewhat wavy in the mass shown in Fig. 4, this is rather an exceptional case; generally it is scarcely waved. Usually one, rarely two, embryo

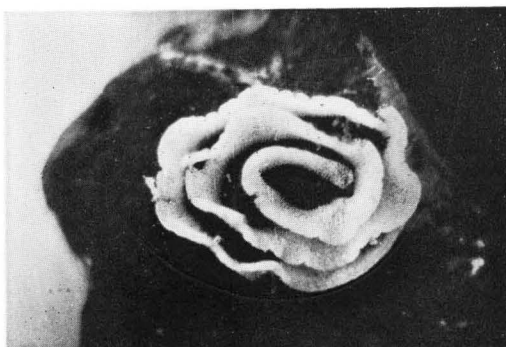


Fig. 4. *Doriopsis aurantiaca* (ELIOT).  
Egg-mass (Original photo taken at Ôkawa on  
August 27, 1961)

is enclosed in a egg-capsule. Both the egg-capsule and the embryo are roundish in shape, the former is 140  $\mu$  and the latter is 100  $\mu$  in diameter.

*Early development*: The egg-mass was brought in the laboratory and the further observations were made under the room temperature from 25° to 32°C. The embryo passed into the earliest stage of veliger on the day of collecting, and hatching out of larva from the egg-capsule took place on the fifth day.

*Veligers*: The newly hatched veliger of this species is just the same as that of the preceding species *Doriopsis viridis*. A large spherical body enclosed in a capsule-like sack is seen very distinctly just behind the intestine in this species, too. This species, however, differs clearly from the preceding species *D. viridis* in the following features of the veliger. The whole body of the veliger is larger than that of *D. viridis*, attaining about 165  $\mu$  in long diameter. The shell of the

newly hatched veliger (Fig. 5) is transparent, although it is coloured very faintly purplish brown as a whole and with a deep dark brownish colouration along the axis of the shell. No sculptures are seen, except for this darkly coloured portion of the shell which is furnished with very minute dots. The shell is sinistral, nearly roundish in outline and about  $140 \times 160 \mu$  in diameters in an examined specimen. The aperture is very large, occupying more than a half of the frontal projection of the shell and longer (antero-posterior) than wide; in *D. viridis* the aperture is evidently wide than longer (cf. Fig. 3, A). The operculum is circular in shape, about  $100 \mu$  in diameter, and with a spiral line.

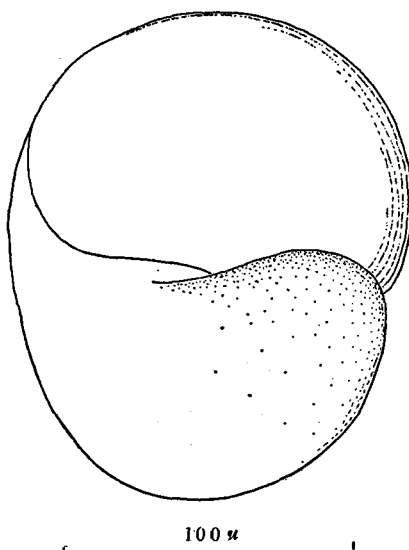


Fig. 5. *Doriopsis aurantiaca* (ELIOT).  
Larval shell, from the ventral side.

### *Eubranchus misakiensis* BABA

(Figs. 6-8)

This species was established by Dr. BABA in 1960. Many slugs of this species were found from the under surface of stones on the shore of Tannowa on March 6, 1961. In nature, the egg-laying takes place very frequently at the same place. The egg-laying can be observed easily on the bottom or wall of glass-vessel in laboratory. The egg-masses (Fig. 6, A) are in a form of slightly curved ribbon and 2 to 3 mm in breadth and 7 to 9 mm in length. It is milky white in colour and fastened to the substratum by its concave border. The egg-capsule of the newly laid egg-mass (Fig. 6, B) is oval in shape and about 115 to 160  $\mu$  in long diameter. Ovum is round and with about 90  $\mu$  diameter.

*Early development*: An animal laid an egg-mass in the glass-vessel on March 7, 1961, when it was 12°C in the room temperature. On the sixth day of the development the embryos passed into the earliest stage of veliger, at this time active rotatory motion of embryos in the capsule was observed. On the thirteenth day, the first hatching out of the veligers from the egg-mass was observed. The room temperature fluctuated from 6° to 21°C during the observations.

*Veligers*: The newly hatched veliger (Fig. 7) is wholly transparent and quite colourless. The shell (Fig. 8, A) is sinistral, ovoid in shape and  $148 \times 274 \mu$  in size in a measured specimen. It is clear, colourless and devoid of any sculptures. The swollen portion of the thickening along the inner part of the axis is not so

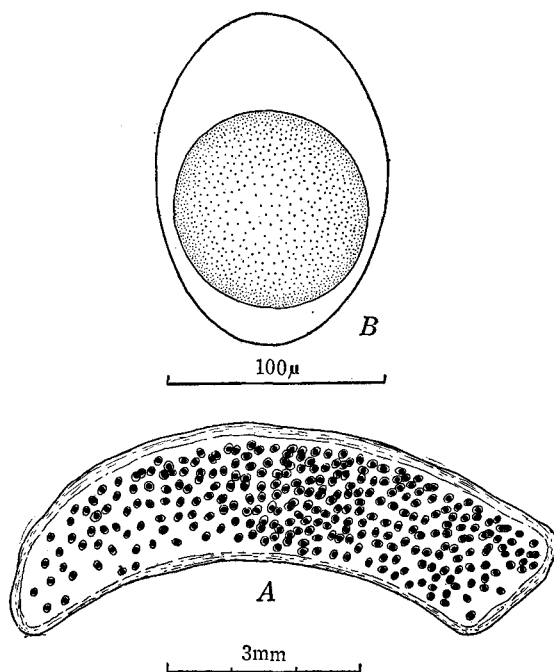


Fig. 6. *Eubranchius misakiensis* BABA.

A. Egg-mass.

B. Ovum in the capsule.

marked, but with one or two slight constrictions at just above the lower end of the thickening. The operculum (Fig. 8, B) is semicircular, about  $80 \times 100 \mu$  in diameters in an examined specimen, and devoid of any sculpture line. The velum and subvelum are present as usual, both velar organs are rather small and devoid of any refracting granules. The foot does not protrude out beyond the operculum edge and it bears two long sensory cilia on each side. The stomach is usually slightly inclined to the right side from the transverse axis of the body. Eyes



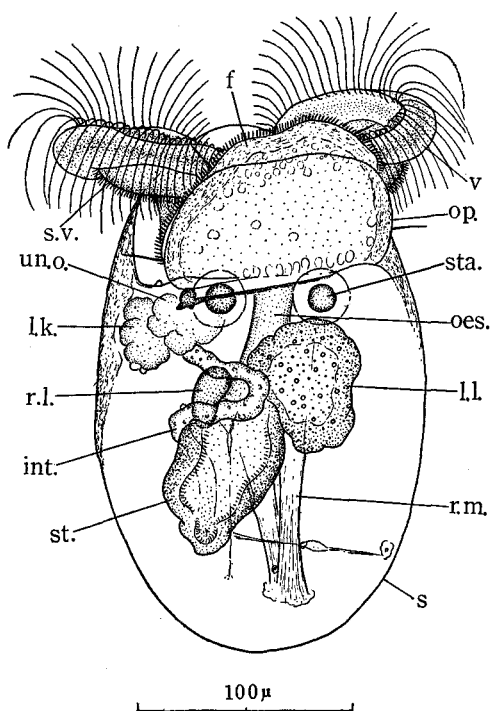


Fig. 7. *Eubbranchus misakiensis* BABA.  
Newly hatched veliger, from the ventral side.

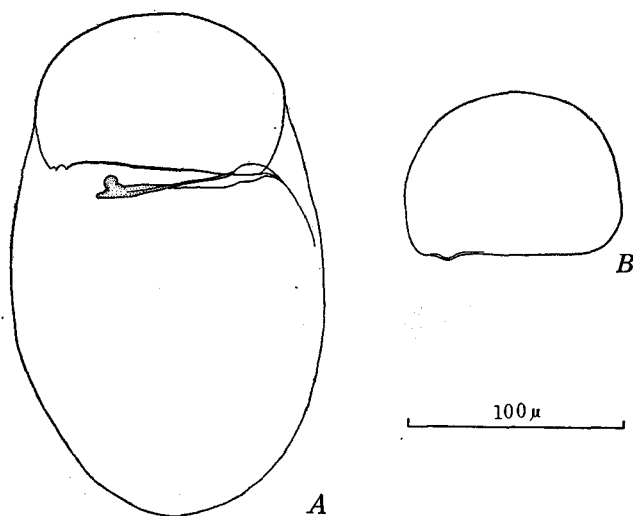


Fig. 8. *Eubbranchus misakiensis* BABA.  
A. Larval shell, from the ventral side.  
B. Operculum.

are absent. There are two liver lobes as usual; and these are colourless. The larger left lobe is rounded and contains some refracting granules, while the smaller right one is elongated and devoid of any granules. The slender intestine is S-shaped and provided with small warty cells on the surface.

A roundish and unpigmented organ, presumably the larval kidney, is situated at just near the anus on the right side of the body. In addition, an unknown organ (un. o.) is seen at the ventral side of the anus; it is colourless and devoid of any granules. There is one small spherical body just behind each statocyst which contains several yellowish brown granules within it. It is not impossible that these spherical bodies are nothing but a pair of rudimentary eyes.

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